



10275-133001.TXT

SEQUENCE LISTING

<110> Chen, Li How
Meade, Harry M.

<120> NOVEL MODIFIED MSP-1 NUCLEIC ACID
SEQUENCES AND METHODS FOR INCREASING MRNA LEVELS AND PROTEIN
EXPRESSION IN CELL SYSTEMS

<130> 10275-133001

<140> US 09/175,684

<141> 1998-10-20

<150> US 60/085,649

<151> 1998-05-15

<150> US 60/062,592

<151> 1997-10-20

<160> 19

<170> FastSEQ for windows Version 4.0

<210> 1

<211> 1065

<212> DNA

<213> Plasmodium falciparum

<220>

<221> CDS

<222> (1)...(1065)

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gag tac gag gtg ctg tac ctg aag ccg ctg gca ggg gtc tac cgg agc	96
Glu Tyr Glu Val Leu Tyr Leu Lys Pro Leu Ala Gly Val Tyr Arg Ser	
20 25 30	

ctg aag aag cag ctg gag aac aac gtg atg acc ttc aac gtg aac gtg	144
Leu Lys Lys Gln Leu Glu Asn Asn Val Met Thr Phe Asn Val Asn Val	
35 40 45	

aag gat atc ctg aac agc cgg ttc aac aag cgg gag aac ttc aag aac	192
Lys Asp Ile Leu Asn Ser Arg Phe Asn Lys Arg Glu Asn Phe Lys Asn	
50 55 60	

gtg ctg gag agc gat ctg atc ccc tac aag gat ctg acc agc agc aac	240
Val Leu Glu Ser Asp Leu Ile Pro Tyr Lys Asp Leu Thr Ser Ser Asn	
65 70 75 80	

tac gtg gtc aag gat ccc tac aag ttc ctg aac aag gag aag aga gat	288
Tyr Val Val Lys Asp Pro Tyr Lys Phe Leu Asn Lys Glu Lys Arg Asp	
85 90 95	

aag ttc ctg agc agt tac aac tac atc aag gat agc att gat acc gat	336
Lys Phe Leu Ser Ser Tyr Asn Tyr Ile Lys Asp Ser Ile Asp Thr Asp	

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100	105	110	
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aag tac aag agc gat ctg gat tca atc aag aag tac atc aac gat aag Lys Tyr Lys Ser Asp Leu Asp Ser Ile Lys Lys Tyr Ile Asn Asp Lys 130 135 140			432
cag gga gag aac gag aag tac ctg ccc ttc ctg aac aac atc gag acc Gln Gly Glu Asn Glu Lys Tyr Leu Pro Phe Leu Asn Asn Ile Glu Thr 145 150 155 160			480
ctg tac aag acc gtc aac gat aag att gat ctg ttc gtg atc cac ctg Leu Tyr Lys Thr Val Asn Asp Lys Ile Asp Leu Phe Val Ile His Leu 165 170 175			528
gag gcc aag gtc ctg aac tac aca tat gag aag agc aac gtg gag gtc Glu Ala Lys Val Leu Asn Tyr Thr Tyr Glu Lys Ser Asn Val Glu Val 180 185 190			576
aag atc aag gag ctg aat tac ctg aag acc atc cag gat aag ctg gcc Lys Ile Lys Glu Leu Asn Tyr Leu Lys Thr Ile Gln Asp Lys Leu Ala 195 200 205			624
gat ttc aag aag aac aac aac ttc gtc ggg atc gcc gat ctg agc acc Asp Phe Lys Lys Asn Asn Asn Phe Val Gly Ile Ala Asp Leu Ser Thr 210 215 220			672
gat tac aac cac aac aac ctg ctg acc aag ttc ctg agc acc ggt atg Asp Tyr Asn His Asn Asn Leu Leu Thr Lys Phe Leu Ser Thr Gly Met 225 230 235 240			720
gtc ttc gaa aac ctg gcc aag acc gtc ctg agc aac ctg ctg gat ggg Val Phe Glu Asn Leu Ala Lys Thr Val Leu Ser Asn Leu Leu Asp Gly 245 250 255			768
aac ctg cag ggg atg ctg aac atc agc cag cac cag tgt gtg aag aag Asn Leu Gln Gly Met Leu Asn Ile Ser Gln His Gln Cys Val Lys Lys 260 265 270			816
cag tgt ccc cag aac agc ggg tgt ttc aga cac ctg gat gag aga gag Gln Cys Pro Gln Asn Ser Gly Cys Phe Arg His Leu Asp Glu Arg Glu 275 280 285			864
gag tgt aag tgt ctg ctg aac tac aag cag gaa ggt gat aag tgt gtg Glu Cys Lys Cys Leu Leu Asn Tyr Lys Gln Glu Gly Asp Lys Cys Val 290 295 300			912
gaa aac ccc aat cct act tgt aac gag aac aat ggt gga tgt gat gcc Glu Asn Pro Asn Pro Thr Cys Asn Glu Asn Asn Gly Gly Cys Asp Ala 305 310 315 320			960
gat gcc aag tgt acc gag gag gat tca ggg agc aac ggg aag aag atc Asp Ala Lys Cys Thr Glu Glu Asp Ser Gly Ser Asn Gly Lys Lys Ile 325 330 335			1008
acc tgt gag tgt acc aag cct gat tct tat cca ctg ttc gat ggt atc Thr Cys Glu Cys Thr Lys Pro Asp Ser Tyr Pro Leu Phe Asp Gly Ile 340 345 350			1056
ttc tgt agt			1065

Phe Cys Ser
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<213> Plasmodium falciparum

<220>
<221> CDS
<222> (1)...(1083)

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gaa tat gag gtt tta tat tta aaa cct tta gca ggt gtt tat aga agt 96
Glu Tyr Glu Val Leu Tyr Leu Lys Pro Leu Ala Gly Val Tyr Arg Ser
20 25 30
tta aaa aaa caa tta gaa aat aac gtt atg aca ttt aat gtt aat gtt 144
Leu Lys Lys Gln Leu Glu Asn Asn Val Met Thr Phe Asn Val Asn Val
35 40 45
aag gat att tta aat tca cga ttt aat aaa cgt gaa aat ttc aaa aat 192
Lys Asp Ile Leu Asn Ser Arg Phe Asn Lys Arg Glu Asn Phe Lys Asn
50 55 60
gtt tta gaa tca gat tta att cca tat aaa gat tta aca tca agt aat 240
Val Leu Glu Ser Asp Leu Ile Pro Tyr Lys Asp Leu Thr Ser Ser Asn
65 70 75 80
tat gtt gtc aaa gat cca tat aaa ttt ctt aat aaa gaa aaa aga gat 288
Tyr Val Val Lys Asp Pro Tyr Lys Phe Leu Asn Lys Glu Lys Arg Asp
85 90 95
aaa ttc tta agc agt tat aat tat att aag gat tca ata gat acg gat 336
Lys Phe Leu Ser Ser Tyr Asn Tyr Ile Lys Asp Ser Ile Asp Thr Asp
100 105 110
ata aat ttt gca aat gat gtt ctt gga tat tat aaa ata tta tcc gaa 384
Ile Asn Phe Ala Asn Asp Val Leu Gly Tyr Tyr Lys Ile Leu Ser Glu
115 120 125
aaa tat aaa tca gat tta gat tca att aaa aaa tat atc aac gac aaa 432
Lys Tyr Lys Ser Asp Leu Asp Ser Ile Lys Lys Tyr Ile Asn Asp Lys
130 135 140
caa ggt gaa aat gag aaa tac ctt ccc ttt tta aac aat att gag acc 480
Gln Gly Glu Asn Glu Lys Tyr Leu Pro Phe Leu Asn Asn Ile Glu Thr
145 150 155 160
tta tat aaa aca gtt aat gat aaa att gat tta ttt gta att cat tta 528
Leu Tyr Lys Thr Val Asn Asp Lys Ile Asp Leu Phe Val Ile His Leu
165 170 175
gaa gca aaa gtt cta aat tat aca tat gag aaa tca aac gta gaa gtt 576
Glu Ala Lys Val Leu Asn Tyr Thr Tyr Glu Lys Ser Asn Val Glu Val
180 185 190
aaa ata aaa gaa ctt aat tac tta aaa aca att caa gac aaa ttg gca 624

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Asp	Phe	Lys	Lys	Asn	Asn	Asn	Phe	Val	Gly	Ile	Ala	Asp	Leu	Ser	Thr		
	210					215					220						
gat	tat	aac	cat	aat	aac	tta	ttg	aca	aag	ttc	ctt	agt	aca	ggt	atg	720	
Asp	Tyr	Asn	His	Asn	Asn	Leu	Leu	Thr	Lys	Phe	Leu	Ser	Thr	Gly	Met		
	225				230					235					240		
ggt	ttt	gaa	aat	ctt	gct	aaa	acc	ggt	tta	tct	aat	tta	ctt	gat	gga	768	
Val	Phe	Glu	Asn	Leu	Ala	Lys	Thr	Val	Leu	Ser	Asn	Leu	Leu	Asp	Gly		
				245					250					255			
aac	ttg	caa	ggt	atg	tta	aac	att	tca	caa	cac	caa	tgc	gta	aaa	aaa	816	
Asn	Leu	Gln	Gly	Met	Leu	Asn	Ile	Ser	Gln	His	Gln	Cys	Val	Lys	Lys		
			260					265					270				
caa	tgt	cca	caa	aat	tct	gga	tgt	ttc	aga	cat	tta	gat	gaa	aga	gaa	864	
Gln	Cys	Pro	Gln	Asn	Ser	Gly	Cys	Phe	Arg	His	Leu	Asp	Glu	Arg	Glu		
		275					280					285					
gaa	tgt	aaa	tgt	tta	tta	aat	tac	aaa	caa	gaa	ggt	gat	aaa	tgt	ggt	912	
Glu	Cys	Lys	Cys	Leu	Leu	Asn	Tyr	Lys	Gln	Glu	Gly	Asp	Lys	Cys	Val		
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Glu	Asn	Pro	Asn	Pro	Thr	Cys	Asn	Glu	Asn	Asn	Gly	Gly	Cys	Asp	Ala		
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gat	gcc	aaa	tgt	acc	gaa	gaa	gat	tca	ggt	agc	aac	gga	aag	aaa	atc	1008	
Asp	Ala	Lys	Cys	Thr	Glu	Glu	Asp	Ser	Gly	Ser	Asn	Gly	Lys	Lys	Ile		
				325					330					335			
aca	tgt	gaa	tgt	act	aaa	cct	gat	tct	tat	cca	ctt	ttc	gat	ggt	att	1056	
Thr	Cys	Glu	Cys	Thr	Lys	Pro	Asp	Ser	Tyr	Pro	Leu	Phe	Asp	Gly	Ile		
			340					345					350				
ttc	tgc	agt	cac	cac	cac	cac	cac	cac	taact							1088	
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<210> 4
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 <213> Plasmodium falciparum

<400> 4	
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gcaaggatga ggaccttcac ggctctcg	88

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<211> 60
 <212> DNA
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<210> 6
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 <212> DNA
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<400> 7
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<220>
 <221> CDS
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 Val Thr Pro Ser Val Ile Asp Asn Ile Leu Ser Lys Ile Glu Asn Glu
 20 25 30

tac gag gtg ctg tac ctg aag ccc ctg gca gga gtc tac agg agc ctg 144
 Tyr Glu Val Leu Tyr Leu Lys Pro Leu Ala Gly Val Tyr Arg Ser Leu
 35 40 45

aag aag cag ctg gag aac aac gtg atg acc ttc aac gtg aac gtg aag 192
 Lys Lys Gln Leu Glu Asn Asn Val Met Thr Phe Asn Val Asn Val Lys
 50 55 60

gat atc ctg aac agc agg ttc aac aag agg gag aac ttc aag aac gtg 240
 Asp Ile Leu Asn Ser Arg Phe Asn Lys Arg Glu Asn Phe Lys Asn Val
 65 70 75 80

ctg gag agc gat ctg atc ccc tac aag gat ctg acc agc agc aac tac 288
 Leu Glu Ser Asp Leu Ile Pro Tyr Lys Asp Leu Thr Ser Ser Asn Tyr
 85 90 95

gtg gtc aaa gat ccc tac aag ttc ctg aac aag gag aag aga gat aag 336
 Val Val Lys Asp Pro Tyr Lys Phe Leu Asn Lys Glu Lys Arg Asp Lys
 100 105 110

ttc ctg agc agt tac aat tac atc aag gat agc att gac acc gat atc 384
 Phe Leu Ser Ser Tyr Asn Tyr Ile Lys Asp Ser Ile Asp Thr Asp Ile

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aac ttc gcc aac gat gtc ctg gga tac tac aag atc ctg tcc gag aag Asn Phe Ala Asn Asp Val Leu Gly Tyr Tyr Lys Ile Leu Ser Glu Lys 130 135 140			432
tac aag agc gat ctg gat agc atc aag aag tac atc aac gat aag cag Tyr Lys Ser Asp Leu Asp Ser Ile Lys Lys Tyr Ile Asn Asp Lys Gln 145 150 155 160			480
gga gag aac gag aag tac ctg ccc ttc ctg aac aac atc gag acc ctg Gly Glu Asn Glu Lys Tyr Leu Pro Phe Leu Asn Asn Ile Glu Thr Leu 165 170 175			528
tac aag acc gtc aac gat aag att gat ctg ttc gtg atc cac ctg gag Tyr Lys Thr Val Asn Asp Lys Ile Asp Leu Phe Val Ile His Leu Glu 180 185 190			576
gcc aag gtc ctg cag tac aca tat gag aag agc aac gtg gag gtc aag Ala Lys Val Leu Gln Tyr Thr Tyr Glu Lys Ser Asn Val Glu Val Lys 195 200 205			624
atc aag gag ctg aat tac ctg aag acc atc cag gat aag ctg gcc gat Ile Lys Glu Leu Asn Tyr Leu Lys Thr Ile Gln Asp Lys Leu Ala Asp 210 215 220			672
ttc aag aag aac aac aac ttc gtc gga atc gcc gat ctg agc acc gat Phe Lys Lys Asn Asn Asn Phe Val Gly Ile Ala Asp Leu Ser Thr Asp 225 230 235 240			720
tac aac cac aac aac ctg ctg acc aag ttc ctg agc acc gga atg gtc Tyr Asn His Asn Asn Leu Leu Thr Lys Phe Leu Ser Thr Gly Met Val 245 250 255			768
ttc gaa aac ctg gcc aag acc gtc ctg agc aac ctg ctg gat gga aac Phe Glu Asn Leu Ala Lys Thr Val Leu Ser Asn Leu Leu Asp Gly Asn 260 265 270			816
ctg cag gga atg ctg cag atc agc cag cac cag tgt gtg aag aag cag Leu Gln Gly Met Leu Gln Ile Ser Gln His Gln Cys Val Lys Lys Gln 275 280 285			864
tgt ccc cag aac agc gga tgc ttc aga cac ctg gat gag agg gag gag Cys Pro Gln Asn Ser Gly Cys Phe Arg His Leu Asp Glu Arg Glu Glu 290 295 300			912
tgc aag tgc ctg ctg aac tac aag cag gaa gga gat aag tgt gtg gaa Cys Lys Cys Leu Leu Asn Tyr Lys Gln Glu Gly Asp Lys Cys Val Glu 305 310 315 320			960
aac ccc aat cct act tgt aac gag aac aat gga gga tgc gat gcc gat Asn Pro Asn Pro Thr Cys Asn Glu Asn Asn Gly Gly Cys Asp Ala Asp 325 330 335			1008
gcc aag tgt acc gag gag gat tca gga agc aac gga aag aag atc acc Ala Lys Cys Thr Glu Glu Asp Ser Gly Ser Asn Gly Lys Lys Ile Thr 340 345 350			1056
tgc gag tgt acc aag cct gat tct tat cca ctg ttc gat ggt att ttc Cys Glu Cys Thr Lys Pro Asp Ser Tyr Pro Leu Phe Asp Gly Ile Phe 355 360 365			1104
tgc agt cac cac cac cac cac taa ctc gag gat cc			1142

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<210> 9
 <211> 355
 <212> PRT
 <213> Plasmodium falciparum

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 35 40 45
 Lys Asp Ile Leu Asn Ser Arg Phe Asn Lys Arg Glu Asn Phe Lys Asn
 50 55 60
 Val Leu Glu Ser Asp Leu Ile Pro Tyr Lys Asp Leu Thr Ser Ser Asn
 65 70 75 80
 Tyr Val Val Lys Asp Pro Tyr Lys Phe Leu Asn Lys Glu Lys Arg Asp
 85 90 95
 Lys Phe Leu Ser Ser Tyr Asn Tyr Ile Lys Asp Ser Ile Asp Thr Asp
 100 105 110
 Ile Asn Phe Ala Asn Asp Val Leu Gly Tyr Tyr Lys Ile Leu Ser Glu
 115 120 125
 Lys Tyr Lys Ser Asp Leu Asp Ser Ile Lys Lys Tyr Ile Asn Asp Lys
 130 135 140
 Gln Gly Glu Asn Glu Lys Tyr Leu Pro Phe Leu Asn Asn Ile Glu Thr
 145 150 155 160
 Leu Tyr Lys Thr Val Asn Asp Lys Ile Asp Leu Phe Val Ile His Leu
 165 170 175
 Glu Ala Lys Val Leu Asn Tyr Thr Tyr Glu Lys Ser Asn Val Glu Val
 180 185 190
 Lys Ile Lys Glu Leu Asn Tyr Leu Lys Thr Ile Gln Asp Lys Leu Ala
 195 200 205
 Asp Phe Lys Lys Asn Asn Asn Phe Val Gly Ile Ala Asp Leu Ser Thr
 210 215 220
 Asp Tyr Asn His Asn Asn Leu Leu Thr Lys Phe Leu Ser Thr Gly Met
 225 230 235 240
 Val Phe Glu Asn Leu Ala Lys Thr Val Leu Ser Asn Leu Leu Asp Gly
 245 250 255
 Asn Leu Gln Gly Met Leu Asn Ile Ser Gln His Gln Cys Val Lys Lys
 260 265 270
 Gln Cys Pro Gln Asn Ser Gly Cys Phe Arg His Leu Asp Glu Arg Glu
 275 280 285
 Glu Cys Lys Cys Leu Leu Asn Tyr Lys Gln Glu Gly Asp Lys Cys Val
 290 295 300
 Glu Asn Pro Asn Pro Thr Cys Asn Glu Asn Asn Gly Gly Cys Asp Ala
 305 310 315 320
 Asp Ala Lys Cys Thr Glu Glu Asp Ser Gly Ser Asn Gly Lys Lys Ile
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 Thr Cys Glu Cys Thr Lys Pro Asp Ser Tyr Pro Leu Phe Asp Gly Ile
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 Phe Cys Ser
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 <212> PRT
 <213> Plasmodium falciparum

<400> 10

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 35 40 45
 Lys Asp Ile Leu Asn Ser Arg Phe Asn Lys Arg Glu Asn Phe Lys Asn
 50 55 60
 Val Leu Glu Ser Asp Leu Ile Pro Tyr Lys Asp Leu Thr Ser Ser Asn
 65 70 75 80
 Tyr Val Val Lys Asp Pro Tyr Lys Phe Leu Asn Lys Glu Lys Arg Asp
 85 90 95
 Lys Phe Leu Ser Ser Tyr Asn Tyr Ile Lys Asp Ser Ile Asp Thr Asp
 100 105 110
 Ile Asn Phe Ala Asn Asp Val Leu Gly Tyr Tyr Lys Ile Leu Ser Glu
 115 120 125
 Lys Tyr Lys Ser Asp Leu Asp Ser Ile Lys Lys Tyr Ile Asn Asp Lys
 130 135 140
 Gln Gly Glu Asn Glu Lys Tyr Leu Pro Phe Leu Asn Asn Ile Glu Thr
 145 150 155 160
 Leu Tyr Lys Thr Val Asn Asp Lys Ile Asp Leu Phe Val Ile His Leu
 165 170 175
 Glu Ala Lys Val Leu Asn Tyr Thr Tyr Glu Lys Ser Asn Val Glu Val
 180 185 190
 Lys Ile Lys Glu Leu Asn Tyr Leu Lys Thr Ile Gln Asp Lys Leu Ala
 195 200 205
 Asp Phe Lys Lys Asn Asn Asn Phe Val Gly Ile Ala Asp Leu Ser Thr
 210 215 220
 Asp Tyr Asn His Asn Asn Leu Leu Thr Lys Phe Leu Ser Thr Gly Met
 225 230 235 240
 Val Phe Glu Asn Leu Ala Lys Thr Val Leu Ser Asn Leu Leu Asp Gly
 245 250 255
 Asn Leu Gln Gly Met Leu Asn Ile Ser Gln His Gln Cys Val Lys Lys
 260 265 270
 Gln Cys Pro Gln Asn Ser Gly Cys Phe Arg His Leu Asp Glu Arg Glu
 275 280 285
 Glu Cys Lys Cys Leu Leu Asn Tyr Lys Gln Glu Gly Asp Lys Cys Val
 290 295 300
 Glu Asn Pro Asn Pro Thr Cys Asn Glu Asn Asn Gly Gly Cys Asp Ala
 305 310 315 320
 Asp Ala Lys Cys Thr Glu Glu Asp Ser Gly Ser Asn Gly Lys Lys Ile
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 Phe Cys Ser His His His His His

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<211> 379

<212> PRT

<213> Plasmodium falciparum

<400> 11

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 Tyr Glu Val Leu Tyr Leu Lys Pro Leu Ala Gly Val Tyr Arg Ser Leu
 35 40 45
 Lys Lys Gln Leu Glu Asn Asn Val Met Thr Phe Asn Val Asn Val Lys
 50 55 60
 Asp Ile Leu Asn Ser Arg Phe Asn Lys Arg Glu Asn Phe Lys Asn Val
 65 70 75 80

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Leu Glu Ser Asp Leu Ile Pro Tyr Lys Asp Leu Thr Ser Ser Asn Tyr
 85 90 95
 Val Val Lys Asp Pro Tyr Lys Phe Leu Asn Lys Glu Lys Arg Asp Lys
 100 105 110
 Phe Leu Ser Ser Tyr Asn Tyr Ile Lys Asp Ser Ile Asp Thr Asp Ile
 115 120 125
 Asn Phe Ala Asn Asp Val Leu Gly Tyr Tyr Lys Ile Leu Ser Glu Lys
 130 135 140
 Tyr Lys Ser Asp Leu Asp Ser Ile Lys Lys Tyr Ile Asn Asp Lys Gln
 145 150 155 160
 Gly Glu Asn Glu Lys Tyr Leu Pro Phe Leu Asn Asn Ile Glu Thr Leu
 165 170 175
 Tyr Lys Thr Val Asn Asp Lys Ile Asp Leu Phe Val Ile His Leu Glu
 180 185 190
 Ala Lys Val Leu Gln Tyr Thr Tyr Glu Lys Ser Asn Val Glu Val Lys
 195 200 205
 Ile Lys Glu Leu Asn Tyr Leu Lys Thr Ile Gln Asp Lys Leu Ala Asp
 210 215 220
 Phe Lys Lys Asn Asn Asn Phe Val Gly Ile Ala Asp Leu Ser Thr Asp
 225 230 235 240
 Tyr Asn His Asn Asn Leu Leu Thr Lys Phe Leu Ser Thr Gly Met Val
 245 250 255
 Phe Glu Asn Leu Ala Lys Thr Val Leu Ser Asn Leu Leu Asp Gly Asn
 260 265 270
 Leu Gln Gly Met Leu Gln Ile Ser Gln His Gln Cys Val Lys Lys Gln
 275 280 285
 Cys Pro Gln Asn Ser Gly Cys Phe Arg His Leu Asp Glu Arg Glu Glu
 290 295 300
 Cys Lys Cys Leu Leu Asn Tyr Lys Gln Glu Gly Asp Lys Cys Val Glu
 305 310 315 320
 Asn Pro Asn Pro Thr Cys Asn Glu Asn Asn Gly Gly Cys Asp Ala Asp
 325 330 335
 Ala Lys Cys Thr Glu Glu Asp Ser Gly Ser Asn Gly Lys Lys Ile Thr
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<211> 82

<212> DNA

<213> Artificial Sequence

<220>

<223> Synthetically generated primer

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60

82

<210> 13

<211> 80

<212> DNA

<213> Artificial Sequence

<220>

<223> Synthetically generated primer

<400> 13

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60

80

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 <400> 16
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 <210> 19
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 <220>
 <223> Synthetically generated primer

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21